

U.S. Patent Application Serial No. 09/669,448
Amendment dated November 12, 2003
Reply to OA of May 23, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A semiconductor laser device comprising:

a substrate;

a first conductivity type cladding layer;

an emission layer;

a second conductivity type carrier blocking layer;

a second conductivity type cladding layer containing Al as a group III element and formed with a ridge portion;

a current blocking layer, formed on said second conductivity type cladding layer around said ridge portion, containing Al as a group III element ~~in this order~~, wherein

an angle θ of inclination on a side surface of said ridge portion with respect to an upper surface of said substrate is at least 70° and not more than 117° ,

a distance t between said emission layer and said current blocking layer satisfies a relation of $t \leq 0.275/(1 - (X_2 - X_1))$ micrometer assuming that X_1 represents a composition ratio of Al in group III elements forming said second conductivity type cladding layer, X_2 represents a composition ratio of Al in group III elements forming said current blocking layer, wherein said

U.S. Patent Application Serial No. 09/669,448
Amendment dated November 12, 2003
Reply to OA of May 23, 2003

distance t includes the thickness of said second conductivity type cladding layer and the thickness of said carrier blocking layer, and

a lower width W of said ridge portion is at least 2 μm and not more than 5 μm .

Claim 2 (Currently Amended): A semiconductor laser device according to claim 1, wherein

said first conductivity type cladding layer contains Al and Ga as group III elements, and X1 represents a composition ratio of Al in a ~~sum of a contents~~ composition of Al and Ga, and

said current blocking layer contains Al and Ga, ~~and~~ as group III elements, and X2 represents the composition ratio of Al in the ~~sum of a contents~~ composition of Al and Ga.

Claim 3 (Original): The semiconductor laser device according to claim 2, wherein

said second conductivity type cladding layer is made of $\text{Al}_{\text{X1}}\text{Ga}_{1-\text{X1}}\text{As}$, and

said current blocking layer is made of $\text{Al}_{\text{X2}}\text{Ga}_{1-\text{X2}}\text{As}$.

Claim 4 (Previously Presented): The semiconductor laser device according to claim 1, wherein

said distance t between said emission layer and said current blocking layer satisfies a relation of $t \leq 0.252/(1 - (X2-X1))$ micrometer.

U.S. Patent Application Serial No. 09/669,448
Amendment dated November 12, 2003
Reply to OA of May 23, 2003

Claim 5 (Previously Presented): The semiconductor laser device according to claim 1,
wherein

said distance t between said emission layer and said current blocking layer is at least $0.15\text{ }\mu\text{m}$.

Claim 6 (Previously Presented): The semiconductor laser device according to claim 1,
wherein

said distance t between said emission layer and said current blocking layer is at least $0.2\text{ }\mu\text{m}$.

Claim 7 (Previously Presented): The semiconductor laser device according to claim 1,
wherein

an upper surface of said substrate is a $\{100\}$ plane or inclined by several degrees, and said ridge
portion extends in a $\langle 011 \rangle$ direction.

Claim 8 (Canceled)

Claim 9 (Withdrawn): A method of manufacturing a semiconductor laser device comprising
steps of:

forming a first conductivity type cladding layer, an emission layer, a second conductivity type
first cladding layer having a prescribed thickness, an etching stop layer and a second conductivity

U.S. Patent Application Serial No. 09/669,448
Amendment dated November 12, 2003
Reply to OA of May 23, 2003

type second layer cladding layer having a composition ratio X_1 of Al in group III elements on a substrate in this order;

partially removing said second cladding layer thereby forming a ridge portion having an angle θ of inclination of at least 70° and not more than 117° on the side surfaces with respect to the upper surface of said substrate and a lower width W of at least $2\text{ }\mu\text{m}$ and not more than $5\text{ }\mu\text{m}$; and

forming a current blocking layer on both sides of said ridge portion so that the distance t between the upper surface of said second conductivity type second cladding layer exposed around said ridge portion and said emission layer satisfies the relation of $t \geq 0.275/(1 - (X_2 - X_1)) [\mu\text{m}]$ assuming that X_2 represents the composition ratio of Al in group III elements and t represents said distance.

Claim 10 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 9, wherein

said first conductivity type cladding layer contains Al and Ga as group II elements, and X_1 represents the composition ratio of Al in the sum of the contents of Al and Ga, and

said current blocking layer contains Al and Ga as group III elements, and X_2 represents the composition ratio of Al in the sum of the contents of Al and Ga.

U.S. Patent Application Serial No. **09/669,448**
Amendment dated November 12, 2003
Reply to OA of **May 23, 2003**

Claim 11 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 10, wherein

said second conductivity type first and second cladding layers are made of $\text{Al}_{x_1}\text{Ga}_{1-x_1}\text{As}$, and
said current blocking layer is made of $\text{Al}_{x_2}\text{Ga}_{1-x_2}\text{As}$.

Claim 12 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 9, wherein

said distance t satisfies the relation of $t \leq 0.252/(1 - (X_2 - X_1))$ [μm].

Claim 13 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 9, wherein

said distance t is at least $0.15 \mu\text{m}$.

Claim 14 (Withdrawn): The semiconductor laser device according to claim 1, wherein

said distance t is at least $0.2 \mu\text{m}$.

Claim 15 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 9, wherein

U.S. Patent Application Serial No. **09/669,448**
Amendment dated November 12, 2003
Reply to OA of **May 23, 2003**

the upper surface of said substrate is the $\{100\}$ plane or inclined by several degrees from the $\{100\}$ plane, and

said step of forming said ridge portion includes steps of forming a mask extending in the $\langle 011 \rangle$ direction and performing etching with said mask.

Claim 16 (Withdrawn): The method of manufacturing a semiconductor laser device according to claim 9, wherein

the upper surface of said substrate is the $\{\bar{1}00\}$ plane or inclined by several degrees from the $\{\bar{1}00\}$ plane, and

said step of forming said ridge portion includes steps of forming a mask extending in the $\langle \bar{0}11 \rangle$ direction and performing etching with said mask.